Abstract

In a complete financial market we consider the discrete time hedging of the American option with a convex payoff. It is well-known that for the perfect hedging the writer of the option must trade continuously in time which is impossible in practice. In reality, the writer hedges only at some discrete time instants.

The perfect hedging requires the knowledge of the partial derivative of the value function of the American option in the underlying asset, explicit form of which is unknown in most cases of practical importance. At the same time several approximation methods are developed for the calculation of the value function of the American option.

We establish in this thesis that, having at hand any uniform approximation of the American option value function at the equidistant discrete rebalancing times it is possible to construct a discrete time hedging portfolio the value process of which uniformly approximates the value process of the continuous time perfect delta-hedging portfolio.

We are able to estimate the corresponding discrete time hedging error that leads to complete justification of our hedging method for the non-increasing convex payoff functions including the important case of the American put. It is essentially based on a recently found new type square integral estimate for the derivative of an arbitrary convex function by Shashiashvili [23]. We generalize the latter square integral estimate to the case of the family of the weight functions, satisfying certain conditions.